An update on groundwater cleanup activities at JPL
Novedades acerca de las actividades de limpieza del agua subterránea en JPL

Bilingual Newsletter March 2005
Boletín bilingüe marzo de 2005

Jet Propulsion Laboratory

This is one in a series of project updates prepared by the National Aeronautics and Space Administration (NASA) to provide the public with information on its groundwater cleanup efforts at the Jet Propulsion Laboratory (JPL).

PROJECT UPDATE

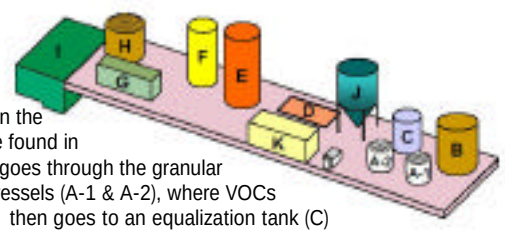
New, On-Site JPL Treatment Plant Will Remove Chemicals from "Source Area" Groundwater

A major piece of NASA's groundwater cleanup effort will soon be in place, when first-phase operations begin at a new water treatment plant on the grounds of the Jet Propulsion Laboratory (JPL).

The plant, located in the north-central section of the 176-acre JPL complex, willremove volatile organic compounds (VOCs) and perchlorate found in groundwater directly beneath JPL. According to NASA Cleanup Project Manager Steve Slaten, the treatment plant will target chemicals located within an eight-acre by 100-foot-thick portion of the aquifer beneath the JPL facility. This area contains more than 68 percent of all unwanted chemical mass associated with groundwater beneath JPL and beneath areas adjacent to JPL.

"On-site treatment is a critical part of the groundwater cleanup effort," Slaten said. "It allows us to remove chemicals at the source area." Removing chemicals from groundwater at the source area will also help reduce the amount of time needed for treatment currently underway at a NASA-funded Lincoln Avenue Water Company (LAWC) plant in Altadena and for treatment at a proposed additional NASA-funded plant.

System Operation



Groundwater is pumped up from extraction wells in the area where chemicals are found in groundwater and initially goes through the granular activated carbon (GAC) vessels (A-1 & A-2), where VOCs are removed. Then water then goes to an equalization tank (C) before it is fed to the fluidized bed reactor (E) through the pumps on the fluidization skid (D). The water is then aerated in the Aeration Tank (F). A final round of filtration occurs in the Trimite Filter unit (G). The clean water is then re-injected into the ground. The backwash sump (I) is used to collect water that is generated from flushing the filters and this sump also collects water from the GAC Backwash Tank (B) and Filter Effluent Tank (H). Clarifier (J) is used to separate the clean water from the resulting sludge that is discharged to the sanitary sewer system occasionally. All operation is controlled and monitored from the control room module (K).

NASA has evaluated different treatment technologies for removing VOCs and perchlorate from the groundwater beneath JPL. Pilot studies showed that a combination of two technologies - the Liquid-phase

Continued on Page Two

Nueva Planta de Tratamiento de Agua

A principios de este año comenzará la primera fase de operaciones de una nueva planta de tratamiento de agua subterránea en el Jet Propulsion Laboratory (JPL).

La planta, localizada en el sitio de JPL, removerá los compuestos orgánicos volátiles (VOCs) y el perclorato del agua subterránea que se encuentra directamente debajo de JPL, en el área con la mayor concentración de productos químicos.

Al remover los productos químicos del agua subterránea en el lugar de origen, se podrá reducir el tiempo necesario para tratar el agua, en una planta de Lincoln Avenue Water Company (LAWC) en Altadena, que ha sido financiada por la NASA, y en otra planta adicional propuesta por la NASA, que también será financiada por la misma.

Steve Slaten, el Gerente encargado del proyecto dijo "la NASA está comprometida a limpiar todos los productos químicos del agua subterránea de los cuales es responsable, esta nueva planta de tratamiento de agua subterránea en JPL es un paso muy importante en el cumplimiento de este compromiso."

CLEANUP PROJECT TO HOST Community Information Session

NASA is inviting the public to the first in a series of Community Information Sessions (CIS) sponsored by NASA's Groundwater Cleanup Project.

Tuesday, March 29
Charles W. Eliot Middle School
2184 N. Lake Avenue Altadena
7 to 9 p.m.

Scheduled for Tuesday, March 29 at the Charles W. Eliot Middle School, 2184 N. Lake Avenue, Altadena, from 7 to 9 p.m., the CIS is an opportunity for the public to learn about the "significant progress we've made in cleaning up groundwater beneath and near the Jet Propulsion Laboratory," according to Project Outreach Manager Merrilee Fellows, "and to give those of us with the Project an opportunity to meet and interact with people, face-to-face, in an informal and relaxed setting, and to hear their thoughts on how NASA is doing."

The CIS will feature a series of standing displays on the cleanup, each staffed by NASA personnel or other experts working on the project who will answer community members' questions about the project.

"The CIS is also a great learning opportunity for students and adults," Fellows said.

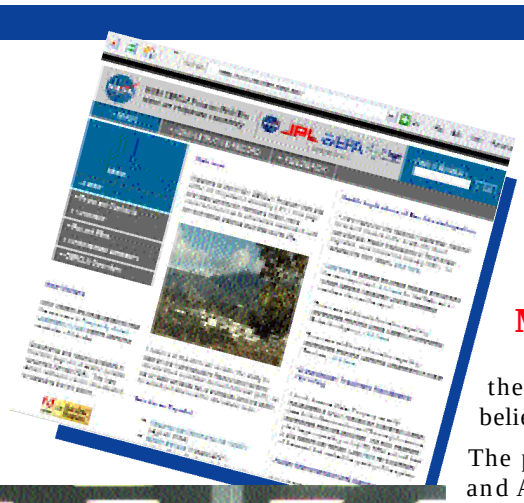
Admission to the CIS is free, and light refreshments will be available. For information, those interested may call Fellows at 818-393-0754. Para información en español llame a: Gabriel Romero, NASA JPL, Teléfono: 818-354-8709.

Sesión Comunitaria

La NASA invita al público a asistir a una Sesión de Información a la Comunidad que se realizará el día martes 29 de marzo de 7 a 9 p.m en la escuela Charles W. Eliot Middle School, 2184 N. Lake Avenue, Altadena. La reunión es informal y es una oportunidad para que el público se entere del progreso que ha logrado la NASA con respecto a la limpieza del agua subterránea debajo y alrededor del Jet Propulsion Laboratory.

Habrá exhibiciones. Representantes de la NASA estarán disponibles para explicar la información y para responder a las preguntas de los miembros de la comunidad.

La admisión es gratis. Se servirán refrescos. Para más información: Gabriel Romero, NASA JPL, Teléfono: 818-354-8709.



Information Repositories, Cleanup Project Website Have Been Streamlined to Maximize Ease of Use

Lori Garner, assistant to NASA Community Outreach Manager Merrilee Fellows, is shown working on Water Cleanup Project files at the NASA Repository inside the Altadena Public Library. The streamlining of NASA information files and binders at the Altadena Library allowed for centralization in standing cabinets of documents that had been stored on an upper, more difficult to reach shelf.

NASA is making it easier for the public to learn, ask questions or provide input to its Groundwater Cleanup Project.

NASA has recently streamlined its "Information Repositories" at three area public libraries and has improved the appearance, interactivity, and ease of use of its Cleanup Project Website at http://JPLwater.nasa.gov.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), sometimes known as the "Superfund" law, requires NASA to maintain an Administrative Record and Information Repository of documents that provide the basis for NASA's actions and decisions on the cleanup project. Additional information is also included that NASA believes will be of interest to local residents.

The public is encouraged to examine those documents at repositories located at the La Cañada Flintridge, Pasadena, and Altadena Public Libraries (see addresses for each on page 4 of this newsletter). An Information Repository for JPL employees only is located at the JPL Library in Building 111 on the JPL campus.

NASA has reorganized the documents at each repository and improved how they are indexed, making it much easier to browse through the information. As part of the reorganization, many of the documents were transferred into digital format and placed onto CDs. The CDs are labeled and can be viewed on library computer terminals, making it easier to browse through the large volumes of project information, much of which is technical in nature.

"As the cleanup project continues," said NASA Outreach Manager Merrilee Fellows, "we produce an increasing amount of information. Converting to CDs takes up less space at the libraries and makes the information more accessible."

Also added recently to each repository is a section "En Espanol" that includes in one place all Spanish-language documents and information that NASA has created on the project.

Each repository now consists of a single, four-drawer filing cabinet with an index prominently situated that will guide the reader through a wealth of project documents.

The entire Administrative Record and an array of other materials are available as well on the cleanup project Website at http://JPLwater.nasa.gov. That Website was recently re-designed, and new materials have been added. Frequently asked questions (FAQs) and a Glossary of Terms will help Web visitors better understand the project. A newly added interactive feature also allows members of the public to ask questions pertaining to the cleanup or submit a comment to NASA.

The Website also features the latest reports and documents created in the project as well as transcripts and/or summaries of all public meetings held to date on the cleanup. Also included are all Spanish-language documents that NASA has created in the course of the project. ■

Materiales en español

La NASA ha creado una sección “En Español” en su página web y en los sitios de información pública denominados “Information Repository” que se encuentran en 3 Bibliotecas Públicas en el área de Pasadena, con el propósito de mantener a las personas de habla hispana informadas acerca de los esfuerzos realizados con respecto a la limpieza del agua subterránea debajo y alrededor del Jet Propulsion Laboratory.

Las bibliotecas públicas donde se encuentran los materiales son las de La Cañada Flintridge, Pasadena y Altadena. (Para obtener las direcciones de las bibliotecas, por favor diríjase a la página 4 de este boletín). La misma información se halla en la página web de la NASA: http://JPLwater.nasa.gov.

Project Update - Continued from Page One

Granular Activated Carbon (LGAC) process to remove VOCs and a Fluidized Bed Reactor (FBR) process to remove perchlorate - showed the most promise. According to Slaten, the plant will pump groundwater via two extraction wells, “one near the top of the aquifer and the other just a little bit lower.” Chemicals will be removed from the water, and the cleansed water will be returned to the aquifer using two injection wells, uphill and up-gradient on the JPL site, in “a virtual closed-loop system.”

Phase I involves pumping and treating up to 125 gallons per minute (gpm), and if successful, a second phase will pump and clean 250 gpm or more of groundwater, a daily volume roughly equivalent to half the amount of water in an Olympic-size swimming pool.

The LGAC technology is a widely used and well accepted technology for VOCs removal, and the more recently developed FBR biological process is being used for groundwater cleanup of perchlorate at several sites in California and elsewhere. Slaten noted that the FBR process, in which naturally occurring bacteria actually consume the perchlorate, “is especially effective in cleaning groundwater where there are higher levels of perchlorate as we have beneath JPL.’

He added, “On the other hand, you can’t turn FBR on and off, as easily as you can with ion exchange. That’s why drinking water purveyors prefer the ion exchange system for perchlorate removal at their well-heads.”

Ion exchange perchlorate removal technology is being used at the NASA-funded LAWC treatment plant and would be used at the proposed City of Pasadena plant in the upper Arroyo Seco.

Asked to summarize the significance of the on-JPL treatment plant to the overall cleanup project and NASA’s stewardship of the environment, Slaten said, “NASA is committed to cleaning up all of the groundwater chemicals for which it is responsible, and this on-site treatment plant will go a long way toward meeting that commitment.” ■

Advanced Perchlorate-Tracking Technology To be Applied to Area Groundwater by NASA Team

Advanced isotopic analysis techniques similar to those being developed in the search for water on Mars are being applied to NASA's groundwater cleanup project back on Earth at the Jet Propulsion Laboratory (JPL).

NASA has been cleaning up both volatile organic compounds (VOCs) and more recently the associated perchlorate in groundwater known to be related to past activities at the JPL site. On page 1 of this newsletter are details of a newon-site treatment plant that recently became operational.

While cleanup efforts continue and progress has been achieved, additional groundwater investigation off-JPL is still needed to determine the complete extent of travel of chemicals in groundwater from historic activities at the JPL site.

The presence of perchlorate in the environment is widespread. As an example, the California Department of Health Services reports on its Website that perchlorate has been detected in 361 drinking water sources in the state. (http://www.dhs.ca.gov/ps/ddwem/chemicals/perchl/monitoringupdate.htm)

Perchlorate has been found in Colorado River water that is imported into Southern California to augment local water supplies; it is also found in certain fertilizers and in a variety of industrial processes and products, including munitions, solid rocket fuel, pyrotechnics (fireworks), the manufacture of matches, additives in lubricating oils, finished leather, electroplating, and aluminum refining.

NASA continues to monitor the presence of perchlorate and VOCs in groundwater originating from historical operations at the JPL site. With recent detections of perchlorate in additional groundwater wells downgradient to JPL but not thought to be related to historic activities at JPL, NASA is seeking a better understanding of groundwater flow patterns and possible sources of the perchlorate.

Isotopic analysis (see sidebar) may be one way of getting the information needed. All isotopes of an element contain the same number of protons, but different isotopes of the same element have different numbers of neutrons in their atoms - thus the compounds that those elements create have a unique chemical “fingerprint.” Isotopic analysis is a way of “fingerprinting” the perchlorate in groundwater, by comparing the ratio of certain chemical isotopes present in or accompanying the perchlorate. For example, naturally occurring perchlorate has a higher value of the Oxygen-17 isotope (an oxygen atom with eight protons and nine neutrons in its nucleus) but a lower Chlorine-37 value (a chlorine atom with 17 protons and 20 neutrons in the nucleus) when compared to synthetic or manufactured samples of perchlorate.

According to NASA Groundwater Cleanup Project Manager Steve Slaten, “Perchlorate isotopic analyses may help distinguish between natural and man-made perchlorate and may even improve the ability to distinguish among various man-made perchlorate sources, especially if each source's unique isotopic “fingerprint” can be determined. It could also give us clues as to whether certain groundwater located off JPL property originated from beneath the JPL facility.”Slaten also noted that the new analyses might help in determining flow patterns of the groundwater near JPL. He explained, “Scientists use a number of approaches to understand complex problems such as how water flows hundreds of feet below ground. Isotopic analysis is one more tool that can provide important clues about those flow patterns.”

He continued, “We can also compare the specific properties of the groundwater that originates beneath the JPL site to the properties of groundwater sampled in other areas of the basin. If those properties are different, it means there are other inputs to the groundwater.”

NASA intends to analyze isotopes of chlorine,oxygen, hydrogen, helium, and strontium in groundwater and has assembled a team of national experts to conduct the analysis, including: Dr. Max Coleman, director of the Center for Life Detection at JPL; Dr. Neil Sturchio of the University of Illinois at Chicago; Dr. Richard Hurst of Hurst and Associates; Dr. Bruce Sass, a geochemist with Battelle; and Michael Land and Eric Reichard of the U.S. Geological Survey (USGS).

In addition to his work for NASA, Dr. Coleman has presented papers or co-authored several scientific papers on isotopic analysis as it applies to the tracking of perchlorate in groundwater on Earth. Dr. Sturchio will conduct the chlorine/oxygen isotope ratio analyses of perchlorate. Dr. Hurst’s work with strontium and stable isotopes will help in the search for sources and types of water associated with perchlorate. The involvement with the team of USGS scientists is important given the regional groundwater investigations performed by this federal government agency in the Los Angeles region.

Initial results are expected within a year. ■

Tracking Groundwater Perchlorate

Isotopic analyses have been used for many years to trace chemicals in water, but recently technologies have been developed to remove perchlorate from water, separate it from other salts, and examine the compound more closely than ever before.

Isotopic analysis examines the perchlorate salt for isotopes of chloride, oxygen, hydrogen, helium, and strontium, as those chemical elements accompany groundwater perchlorate in different ratios depending on the source of perchlorate.

All isotopes of an element contain the same number of protons, but different isotopes of the same element have different numbers of neutrons.

Naturally occurring perchlorate from Chile’s Atacama Desert, for instance, was shown in one study to have a much higher value of the Oxygen-17 isotope (an oxygen atom with eight protons and nine neutrons in its nucleus) but a lower Chlorine-37 value (a chlorine atom with 17 protons and 20 neutrons in the nucleus) when compared to synthetic or manufactured samples of perchlorate.

Localización de rastros de perclorato

La NASA está conduciendo muchas actividades de limpieza del agua. Además de estos esfuerzos, la NASA continúa estudiando el desplazamiento del perclorato en el agua subterránea.

La NASA está usando varios métodos para estudiar la distancia que han viajado los compuestos químicos del agua subterránea localizada a grandes profundidades.

Este estudio también puede ayudar a determinar si existen otras fuentes posibles de perclorato que están contribuyendo al agua subterránea del área. Un procedimiento especial que la NASA está usando, llamado Análisis de Isótopos, examina la composición química del agua subterránea. Los resultados iniciales de este estudio estarán disponibles dentro de un año.

For more information contact

Merrilee Fellows
Water Cleanup Outreach Manager
818-393-0754

OR

Steve Slaten
Remedial Project Manager
818-393-6683

Para más información en español llame a

Gabriel Romero
NASA JPL
Teléfono: 818-354-8709

NASA Management Office
4800 Oak Grove Drive
Pasadena, CA 91109

For More Information

Documents on JPL groundwater cleanup activities are available for review at the following Information Repositories:

Para más información en español llame a:
Gabriel Romero
NASA JPL
Teléfono: 818-354-8709

La Cañada Flintridge Public Library
4545 Oakwood Ave ■ La Cañada Flintridge, California 91011 ■ 818-790-3330

Pasadena Central Library
285 E. Walnut St. ■ Pasadena, California 91101 ■ 626-744-4052

Altadena Public Library
600 E. Mariposa Ave. ■ Altadena, California 91001 ■ 626-798-0833

JPL Repository
(JPL Employees Only) ■ 4800 Oak Grove Dr., Bldg. 111 ■ 818-354-4200

PRINTED ON RECYCLED PAPER

VISIT OUR WEBSITE AT
VISITE NUESTRA PÁGINA WEB
http://JPLwater.nasa.gov

Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91109

PRSRT STD
U.S.POSTAGE
PAID
PASADENA, CA
PERMIT #740

Bilingual Newsletter March 2005
Boletín bilingüe marzo de 2005

An update on groundwater cleanup activities at JPL
Novedades acerca de las actividades de limpieza del agua subterránea en JPL

Join Us!
Community Information Session
TUESDAY, MARCH 29, 2005
7-9 p.m.
Eliot Middle School, Altadena

¡Asistan!
Sesión Comunitaria
MARTES, 29 DE MARZO DE 2005
7-9 p.m.
Eliot Middle School, Altadena